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Obſervations and Tryals

About the Reſemblances *and* Differences *between a* Burning Coal *and* Shining Wood.

T*Heſe particulars were already in our hands, when we publiſh'd the Experiments made on* ſhining Wood *and* Fiſh, *in the laſt Papers, (imparted then by the ſame noble Author Mr.* Boyle) *that thoſe were; but wanted then room enough to contain theſe, which now follow, as they were ſent in a Letter from* Oxford, *viz.*

S ſ ſ And

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And now, *Sir*, ſeeing the want of *Shining Wood* hath kept me ever ſince I ſent you the former Experiments from making any new ones on that Subject, I ſhall, by way of amends, ſubjoyn ſome of the Obſervations, that I heretofore intimated to you, I had made of the *Reſemblances* and *Differences* between a *Live Coal* and a piece of *Shining Wood*; in purſuing of which, you will eaſily diſcern, that to thoſe particulars, which my Memory and the former Obſervations, I had noted down about light and luminous *Bodies*, had ſuggeſted to me, I have added ſome that have been afforded me by thoſe late Tryals made in my Engine, whereof I ſent you an account.

Reſemblances.

The things, wherein I obſerved a piece of *Wood* and a burning *Coal* to agree or reſemble each other, are principally theſe Five.

1. *Both of them are* Luminaries, *that is, give Light, as having it (if I may ſo ſpeak) reſiding in them, and not like* Looking-Glaſſes *or white Bodies, which are conſpicuous only by the incident beams of the Sun, or ſome other Luminous Body, which they reflect.*

This is evident, becauſe both *Shining Wood* and a *Burning Coal* ſhine the more vividly, by how much the place wherein they are put is made the darker, by the careful excluſion of the adventitious light. 'Tis true, that the *Moon* and *Venus* appear brighteſt at or about Midnight, and yet have but a borrowed light; but the difference between thoſe *Planets* and the Bodies we treat of, in reference to the difficulty we are conſidering, is obvious enough. For, though the beholder's Eye, that looks upon thoſe Stars, be advantag'd by being in the dark, which enlarges the *pupil* of the Eye, yet the Object it ſelf is freely expoſed to the beams of the *Sun*, which if they were intercepted, thoſe *Planets* would quickly be darken'd, as experience manifeſts in *Eclipſes*.

2. *Both* Shining Wood *and a* Burning Coal *need the preſence of the Air, and are too of ſuch a denſity, to make them continue ſhining.*

This has been prov'd as to a *Coal*, by what I long ſince publiſh'd in my *Phyſico-Mechanical Experiments*, where I relate, How quickly a Coal would be extinguiſh'd upon the withdrawing the Air from about it: And as to *Shining Wood*, the Experiments I lately ſent you, make it needleſs for me to add any other proof of the requiſiteneſs not only of Air, but of Air of ſuch a thickneſs, to make its Light continue. How far this is applicable to *Flame* it is not neceſſary here to determin; though, when I have the ſatisfaction of ſeeing you again, I may tell you ſomething about that *Queſtion*, which perhaps you do not expect.

3. *Both* Shining Wood *and a* Burning Coal, *having been deprived for a time of their light, by the withdrawing of the contiguous Air, may preſently recover it by letting in freſh Air upon them.*

The *former* part of this, particular Tryals have often ſhewn you to be true, when kindled Coals, that ſeem to be extinguiſht in our exhauſted Receivers, were preſently reviv'd when the Air was reſtored to them: And the *latter* part is abundantly manifeſt by the Experiments, to which this Paper is an *Appendance*.

4. *Both a* Quick Coal *and* Shining Wood *will be eaſily quench'd by water and many other Liquors.*

The truth of this, as to *Coals*, is too obvious to need a proof, and therefore I ſhall confirm it only as to *Wood*. For which purpoſe you may be pleas'd to take the following Tranſcript of ſome of my *Notes* about Light.

I took a piece of *ſhining Wood*, and having wetted it with a little common Water in a clear Glaſs, it preſently loſt all its light *.

The like Experiment I tried with ſtrong *Spirit of Salt*, and alſo with weak *Spirit* of *Sal Armoniack*; but in both, the light did upon the *Wood*'s imbibing of the Liquor preſently diſappear.

And leſt you ſhould think, that in the words, *Many other Liquors*, I intended not to compriſe any, that conſiſt of ſoft and unctuous parts, or that are highly inflamable, I ſhall ſub-

* From hence you will eaſily gather the reaſon why, when I lately told you of the Trial I made with a piece of *Shining Fiſh* under Water in the unexhauſted Receiver, I did not propoſe to have the like Trial made with *Shining Wood* and *Water*; but for *this* Liquor ſubſtituted *Mercury*.

joyn a couple of *Notes,* that I find next to thoſe juſt now tranſcribed.

I made the like Tryal with rectified *Oyl* of *Turpentine,* with a not unlike ſucceſs. The ſame Experiment I tried more than once with high rectified *Spirit* of *Wine,* which did immediately deſtroy all the light of the Wood that was immerſed in it; and having put a little of that Liquor with my finger upon a part of the whole piece of Wood that ſhone very vigorouſly, it quickly did, as it were, quench the Coal as far as the Liquor reach'd; nor did it in a pretty while regain its luminouſneſs: (Which whether it recover'd at all, I know not; for this Trial being made upon my Bed, I fell aſleep, before I had waited long enough to finiſh the Obſervation.)

5. *As a* Quick Coal *is not to be extinguiſht by the coldneſs of the Air, when that is greater than ordinary; ſo neither is a piece of* Shining Wood *to be deprived of its light by the ſame quality of Air.*

As much of this Obſervation as concerns the *Coal,* will be readily granted, and for proof of the other part of it, I could relate to you more Trials than one, but that I ſuppoſe, one may ſuffice, circumſtanc'd like that, which I ſhall now relate.

I took a ſmall piece of *Shining Wood,* and put it into a ſlender Glaſs-pipe, ſealed at one end, and open at the other, and placed this Pipe in a Glaſs Veſſel, where I cauſed to be put a ſtrongly frigorifick mixture of *Ice* and *Salt,* and having kept it there full as long as I thought would be requiſie to freeze an Aqueous Body, I afterwards took it out, and perceived not any ſenſible Diminution of its light. But to be ſure, the frigorifick mixture ſhould not deceive me, I had placed by this Pipe another, almoſt filled with Water, which I found to be turn'd into *Ice*; and though I ſuffered the Wood to remain, a pretty while after, expoſed to ſo intenſe a Cold, yet when I took it out, it continued ſhining, and, if I much miſtake not, it ceaſed not to do ſo, when I look'd on it, 24 hours after. But though the light of *Shining Fiſh* be uſually (as far as I have obſerved) more vigorous and durable, than that of *Shining Wood*; yet I cannot ſay, that it will hold out againſt *Cold* ſo well as the other: For having ordered one of my Servants to cut off a good large piece

piece of the luminous *Whiting*, and bury it in *Ice* and *Salt*, when I call'd for it in leſs than half an hour after, I found it much ſtiffen'd by the Cold, and to have no light, that I could diſcern in a place dark enough. And for fear, that this effect may have proceeded not barely from the operation of the *Cold*, but alſo from that of the *Salt* (for which ſuſpicion you would ſee reaſon enough, if I could ſhew you my Trials about *Shining Fiſh*) I cauſed another time a piece of *Whiting* to be put in a Pipe of Glaſs ſeal'd at one end, and having ſeen it ſhine there, I look'd upon it again, after it had ſtayed but a quarter of an hour, by my eſtimate, in a frigorifick mixture, which the Glaſs kept from touching the Fiſh; and yet neither I, nor a Youth that I employed to look on it, could perceive in a dark place, that it retained any light; which *whether* the Cold had deprived it of by that great change of Texture, that the Congelation of the Aqueous Juice of the Fiſh (which I have ſeveral times obſerved to be luminous) may be ſuppoſed to have made in the Body invaded by it; *or* whether the effect depend more principally on ſome other cauſe, I ſhall not now examine.

Differences.

1. *The firſt difference I obſerved betwixt a* Live Coal *and* Shining Wood, *is, That whereas the light of the former is readily extinguiſhable by Compreſſion (as is obvious in the practice of ſuddenly extinguiſhing a piece of Coal by treading upon it) I could not find that ſuch a Compreſſion; as I could conveniently give, without loſing ſight of its operation, would put out, or much injure the light, even of ſmall fragments of* Shining Wood. One of my Trials about which I find thus ſet down among my *Notes* about Light.

I took a piece of *Shining Wood*, and having preſs'd it between two pieces of clear Glaſs (whereof the one was pretty flat, and the other convex) ſo that I could clearly ſee the Wood through the Glaſs, I could not perceive, that the compreſſion, though it ſometimes broke the Wood into ſeveral fragments, did either deſtroy or conſiderably alter the Light.

This Experiment I repeated with the ſame ſucceſs. But what a ſtronger or more laſting Compreſſion may do in this caſe, I had not opportunity to try.

2. *The next unlikeneſs to be taken notice of betwixt* Rotten Wood *and a* Kindled Coal, *is, That the latter will in very few minutes be totally extinguiſht by the withdrawing of the Air; whereas a piece of* Shining Wood, *being eclipſed by the abſence of the Air, and kept ſ[o] for a time, will immediately recover its Light, if the Air be let in upon it again within half an hour after it was firſt withdrawn.*

The *former* part of this Obſervation is eaſily proved by the Experiments that have been often made upon *Quick Coals* in the *Pneumatical Engine*; and the truth of the latter part appears by an Experiment about *Shining wood* made by us in *October* laſt. Neither is it unprobable, that if I had had conveniency to try it, I ſhould have found, that a piece of *Shining wood*, deprived of its light by the removal of the ambient Air, would retain a diſpoſition to recover it upon the return of the Air, not only for half an *hour*, (which is all that I lately aſſerted) but for half a *day*, and perhaps a longer time.

3. *The* next *difference to be mentioned, is, That a* Live Coal *being put into a ſmall cloſe Glaſs, will not continue to burn for very many minutes; but a piece of* Shining Wood *will continue to ſhine for ſome whole days.*

The *firſt* part of the Aſſertion I know you will readily grant, and the rather, becauſe it contains matter of fact, without at all determining, whether the Coals not continuing to burn, proceeds from its being, as it were, ſtifled by its own ſmoak and exhalations, (which can have no vent in a ſmall cloſe Glaſs) or from the want of freſh Air, or from any particular cauſe, which I muſt not here debate; though I have ſometimes made Experiments ſomewhat odd to facilitate that enquiry. The *other* part of our Obſervation may be eaſily made out by what I tried upon *Shining wood*, ſealed up Hermetically in very ſmall Glaſſes, where the Wood did for ſeveral days (though I remember not preciſely how many) retain its Light.

4. *A* fourth *Difference may be this: That whereas a Coal, as it burns, ſends forth ſtore of ſmoak or exhalations;* Luminous Wood *does not ſo.*

5. *A* fifth, *flowing from the former, is, That whereas a* Coal *in ſhining waſts it ſelf at a great rate,* Shining Wood *does not.*

Theſe two unlikeneſſes I mention together, not only becauſe of their affinity, but becauſe what concerns the *Coal* in both, will need no proof; and as for what concerns *Rotten Wood*, it may be verified by an Obſervation, that I find by my *Notes* I made in a piece of it Hermetically ſealed up in a ſmall clear Glaſs; where after it had continued luminous ſome days, I lookt on it in the day-time to perceive, if any ſtore of ſpirits or other ſteams had, during all that while, exhaled from the Wood, but could not find any on the inſide of the Glaſs, ſave that in one place there appeared a kind of Dew, but conſiſting of ſuch very ſmall drops (if at leaſt their Size were not below that name) that a multitude of them would go to the making up of one ordinary drop. But in pieces of *Shining Fiſh* I found the caſe much otherwiſe, as was to be expected.

6. *The* laſt *Difference I ſhall take notice of betwixt the Bodies hitherto compared, is, That a* Quick Coal *is actually and vehemently hot; whereas I have not obſerved* Shining Wood *to be ſo much as ſenſibly lukewarm.*

What is ſaid of the *Coals* heat, being as manifeſt as its light, I ſhall need only to make out what relates to the *Shining Wood.* To aſſiſt me wherein, I meet among my *Notes* that, whoſe Tranſcript I ſhall ſubjoyn, when I have premis'd, that (if my memory do not deceive me) the piece of Wood to be mentioned was one, that ſhone ſo vividly, that waking in the Night ſome hours before I tryed it, and perceiving, as it lay near me on the Bed, how luminous it was, I was invited to reach out to a place near the Beds-head, where there ſtood ſeveral Books, and laying the Wood on that which came to hand, I could diſcern by the light of it, that the Book was an *Hebrew* Bible, and that of the Page I lighted on, the wrong end was turned upwards: To which intimation

tion having added, that the little Glaſs-Inſtrument, mentioned in the *Note*, is ſuch an one, as you may find deſcribed in my *Preliminaries* to the *Hiſtory of Cold*, ſave that part of this was a little bending inward at the *Baſis*, that it may ſometimes ſtand by *it ſelf*, and ſometimes receive a ſmall body into the *dimple* at its *Baſis*: Having, I ſay, premiſed this, and, that as *Shining Wood* did not feel at all warm to me, ſo I alſo found *Shining Fiſh* palpably cold, I ſhall conclude your trouble with the premiſed *Note*, which ſpeaks thus:

[I put upon a large piece of Wood, which was partly ſhining, and, as near as I could, upon one of the moſt luminous parts of it, one of thoſe *Thermoſcopes*, that I make with a pendulous drop of Water. But as I had formerly try'd, that by laying the tip of my Noſe or Finger upon it, when it ſhone vividly enough, to enable me to diſcern both the one and the other, at the time of contact I could not perceive the leaſt of heat, but rather an actual coldneſs; ſo by this Trial I could not ſatisfie my ſelf, that it did viſibly raiſe the pendulous drop, though the Inſtrument were ſo tender, that by approaching one Finger near it, yet without actually touching of it, it would manifeſtly be impelled up, and upon the removal of my Finger, would preſently deſcend again.]

And I remember, that having put ſuch an Inſtrument upon a *Shining Fiſh*, that was pretty large, I could not thereby perceive, that it had any degree of heat, but rather the contrary. For having divers times taken off the Glaſs, to apply it with the more advantage to ſeveral parts of the *Luminous Fiſh*, I divers times (for I remember not whether 'twere always) took notice, that upon the removal of the Glaſs into the Air, the pendulous drop would manifeſtly riſe a little, and ſubſide again when the Glaſs was applied to the Fiſh. But whether this part of the Experiment will hold in all temperatures of the Air, I had not opportunity to try.